

Guideline for the Prevention and Management of
Methicillin-Resistant *Staphylococcus aureus* (MRSA),
Vancomycin-Resistant *Enterococcus* (VRE), and
Vancomycin-Intermediate/Resistant *Staphylococcus aureus*
(VISA/VRSA) in Indiana Health Care

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and

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Guideline for the Prevention and Management of Methicillin-Resistant *Staphylococcus aureus* (MRSA), Vancomycin-Resistant *Enterococcus* (VRE), and Vancomycin-Intermediate/Resistant *Staphylococcus aureus* (VISA/VRSA) in Indiana Health Care

Guideline for the Prevention and Management of Multidrug-Resistant Organisms (MDRO) in Indiana

I. Statement of Purpose

The overall purpose of this document is to provide guidance on infection control practices in Indiana when testing, treating, and caring for individuals with the following multidrug-resistant microorganisms: methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* (VRE), and vancomycin-intermediate/resistant *Staphylococcus aureus* (VISA/VRSA). Although MRSA, VRE, and VISA/VRSA are the only multidrug-resistant organisms (MDRO) discussed, several sections of this document can be utilized when dealing with any MDRO. **In this document, MDRO refers only to MRSA, VRE, VISA, and VRSA.**

This Indiana Guideline has been prepared to assist any facility or agency in the prevention, management, and control of resistant organisms. It should not be used as the sole basis of infection control precautions for resistant organisms or as an interpretation of existing regulations. Rather, the Guideline is intended to provide measures to prevent transmission of these epidemiologically important organisms and to promote the appropriate use of antimicrobial agents in all health care settings.

II. Background

Bacteria and other disease-causing microorganisms have a remarkable ability to mutate and acquire resistant genes from other organisms and thereby develop resistance to antimicrobial agents. When an antimicrobial agent is used, the selective pressure exerted by the agent favors the growth of organisms that are resistant to the agent's action. The inappropriate use of antimicrobial drugs has resulted in drug resistance that threatens to reverse the achievements of the last half century.

Staphylococcus aureus (*S. aureus*) is an important cause of health-care associated infections. The organism can cause mild skin infections to potentially fatal systemic infections. During the 1980s, the bacteria became increasingly resistant to semisynthetic penicillin, leading to the reliance on vancomycin for treatment when this resistant pattern was noted. Currently, *S. aureus* susceptibility to vancomycin may no longer be assumed. The following CDC definitions are based on the laboratory breakpoints published by the National Committee for Clinical Laboratory Standards (NCCLS):

- Vancomycin-susceptible *S. aureus*: Vancomycin minimum inhibitory concentration (MIC) $\leq 4\mu\text{g/ml}$
- Vancomycin-intermediate *S. aureus* (VISA): Vancomycin MICs = $8\text{--}16\mu\text{g/ml}$
- Vancomycin-resistant *S. aureus* (VRSA): Vancomycin MICs $\geq 32\mu\text{g/ml}$

The epidemiology of MRSA appears to be changing. Strains of MRSA which were largely confined to hospitals and long-term care facilities are now emerging in the community.

Currently, the community strains tend to be susceptible to other antibiotic classes and are resistant only to beta-lactam antibiotics. Typing of the community strains by pulse-field gel electrophoresis suggests that these strains are distinctive. Thus, the concern of transmission of MDRO is no longer an exclusive issue of hospitals and long-term care facilities.

VRE has been a concern of hospitals for over a decade. Two of the species of VRE are thought to be most pathogenic. Those two species are *E. faecalis* and *E. faecium*.

III. Definition of Multidrug-Resistant Organisms (MDRO)

The *Guideline for Isolation Precautions in Hospitals*, developed by the Hospital Infection Control Practices Advisory Committee of the U.S. Centers for Disease Control and Prevention (CDC), defines multidrug-resistant bacteria as “resistant bacteria judged by the infection control program, based on current state, regional, or national recommendations to be of special clinical and epidemiologic significance.”

IV. The Difference between Colonization and Infection

Colonization is the presence, growth, and multiplication of the organism without observable clinical symptoms. Infection refers to the invasion of bacteria into tissue with replication of the organism. Infection is characterized by isolation of the organism accompanied by clinical signs of illness such as fever, elevated white blood count, and inflammation. Both colonized and infected patients are major reservoirs of MDRO.

V. Transmission, Reservoir, and Reporting Requirements of MDRO in Indiana

A. MRSA

Mode of Transmission

MRSA is transmitted by contact with a person who is infected or colonized with the organism. Hands of health care workers appear to be the most likely mode of transmission of MRSA from patient to patient. Studies have shown that MRSA can be present on the hands of personnel after performing activities such as wound debridement, dressing changes, tracheal suctioning, and catheter care.

Some community-associated outbreaks of MRSA have been documented among drug users and certain athletic groups. Many persons with community-associated MRSA have no identified risk factors.

Reservoir

Colonized and infected patients are the major reservoir of MRSA. This organism colonizes the skin and anterior nares. MRSA has also been isolated from environmental surfaces including floors, sinks, work areas, tourniquets used for blood drawing, and blood pressure cuffs.

Reporting Requirements

Individual cases are not reportable to the Indiana State Department of Health (ISDH). However, outbreaks of MRSA in hospitals and health care facilities must be reported to the ISDH (410 IAC 1-2.3).

B. VRE

Mode of Transmission

Recent reports have demonstrated that *Enterococcus* spp., including VRE, can be spread from one patient to another patient by direct contact via transient carriage on the hands of personnel or indirectly by contact with contaminated environmental surfaces and patient care equipment.

Reservoir

Enterococcus spp. are part of the normal flora of the gastrointestinal tract and female genitourinary tracts. Most infections with these microorganisms have been attributed to the patient's own flora. However, VRE is capable of prolonged survival on hands, gloves, and environmental surfaces. Studies have found that *Enterococcus* spp. can survive in the environment for days.

Reporting Requirements

Individual cases are not reportable to ISDH. However, outbreaks of VRE in hospitals and health care facilities must be reported to the ISDH (410 IAC 1-2.3).

C. VISA/VRSA

Mode of Transmission

Due to low incidence, there is insufficient data on transmission from one patient to another patient. VISA and VRSA infections are rare. As of 2003, persons who developed VISA and VRSA infections had several underlying health conditions (such as diabetes and kidney disease), previous infections with methicillin-resistant *Staphylococcus aureus* (MRSA), tubes going into their bodies (such as intravenous [IV] catheters), recent hospitalizations, and recent exposure to vancomycin and other antimicrobial agents.

Reservoir

Due to low incidence, there is insufficient data on reservoirs.

Reporting Requirements

Individual cases of *S. aureus* with vancomycin resistance equal to or greater than 8µg/mL must be reported to the ISDH, and the isolate must be sent to the ISDH Microbiology Laboratory. Outbreaks of MDRO in hospitals and health care facilities must be reported to the ISDH (410 1-2.3).

VI. Risk Factors for MDRO

Risk factors for acquisition/transmission of MDRO may include but are not limited to:

- Receiving multiple antibiotics or treatments with antibiotics.
- Transferred from another health care facility/agency or unit with a high colonization/infection rate.
- Having a prolonged hospital stay.
- Frequent hospital admissions.
- Critically ill and in an ICU-type unit.

Early reports of community-associated MRSA indicated infection in persons with risk factors, such as contact with a health care facility or previous antimicrobial therapy. More recent studies suggest that transmission of MRSA in the community can occur without the identified risk factors.

VII. Appropriate Antimicrobial Therapy

Antimicrobial agents are very important tools for treating infectious diseases. Their proper use is essential for patients to recover from the infectious process, as well as to avoid potential toxic effects, reduce associated costs, and reduce the emergence of resistance. Studies suggest that inappropriate antimicrobial use generally precedes the emergence of antimicrobial resistance. Therefore, it is essential to address this issue as the cornerstone of a program designed to prevent the emergence of MDRO.

Antimicrobial management involves a multidisciplinary team approach. This team ideally includes the physician, pharmacist, microbiologist, and infection control practitioner. Additionally, each facility is encouraged to develop guidelines that outline and assist in the appropriate use of antimicrobials, based on national standards and local experience.

The guidelines should include:

- Formulary management.
- Pharmacodynamic principles.
- Principles for empiric therapy.
- Principles of known pathogen therapy.
- Principles of prudent antimicrobial utilization.
- Principles for prophylactic therapy.
- Principles of prevention and control of nosocomial infections.

Because MRSA and VRE are among the predominant transmissible MDRO, appropriate use of antimicrobials associated with these two organisms must be addressed. Vancomycin, clindamycin, ciprofloxacin, metronidazole, imipenem, and third-generation cephalosporins have all been associated with the development of VRE, so it is prudent to develop antimicrobial management strategies that deal with all antimicrobials. However, because vancomycin overuse has been a particular problem, the health care providers should follow the guidance listed below when considering vancomycin use.

A. Situations when the Use of Vancomycin Is Appropriate or Acceptable

Situations when the use of vancomycin is appropriate or acceptable:

- For treatment of serious infections caused by beta-lactam resistant, gram-positive organisms. Vancomycin may be less rapidly bactericidal than are beta-lactam agents for beta-lactam susceptible staphylococci.
- For treatment of infections caused by gram-positive organisms in patients who have serious allergies to beta-lactam antimicrobials.
- When antibiotic-associated colitis fails to respond to metronidazole therapy or is severe and potentially life threatening.
- Prophylaxis, as recommended by the American Heart Association, for endocarditis following certain procedures in patients at high risk for endocarditis.

- Prophylaxis for major surgical procedures involving implantation of prosthetic materials or devices at institutions that have a high rate of infections caused by MRSA or methicillin-resistant *Staphylococcus epidermidis*.

B. Situations when the Use of Vancomycin Should Be Discouraged

Situations when the use of vancomycin should be discouraged:

- Routine surgical prophylaxis other than in a patient who has a life-threatening allergy to beta-lactam antibiotics.
- Empiric antimicrobial therapy for a febrile neutropenic patient, unless initial evidence indicates that the patient has an infection caused by gram-positive microorganisms (e.g., at an inflamed exit site of a Hickman catheter) and the prevalence of infections caused by MRSA in the facility is substantial.
- Treatment in response to a single blood culture positive for coagulase-negative *Staphylococcus* (CoNS), if other blood cultures taken during the same time frame are negative (i.e., if contamination of the blood culture is likely). Because contamination of blood cultures with skin flora could result in inappropriate administration of vancomycin, phlebotomists and other personnel who obtain blood cultures should be trained to minimize contamination of specimens.
- Continued empiric use of presumed infections in patients whose cultures are negative for beta-lactam resistant, gram-positive microorganisms.
- Systemic or local (e.g., antibiotic lock) prophylaxis for infection or colonization of indwelling central or peripheral intravascular catheters.
- Selective decontamination of the digestive tract.
- Eradication of MRSA colonization.
- Primary treatment of antibiotic-associated colitis.
- Routine prophylaxis for very low birth-weight infants (i.e., weight <1500 g).
- Treatment (chosen for dosing convenience) of infections caused by beta-lactam sensitive gram-positive microorganisms in patients who have renal failure.
- Use of vancomycin solution for topical application or irrigation.

VIII. Surveillance

Surveillance of MDRO is critical to providing early warning of emerging problems, monitoring changing patterns of resistance, and targeting and evaluating prevention and control measures.

In some facilities, antimicrobial susceptibility testing of resistant organisms from urine or nonsterile body sites is not routinely performed. Because of this, identification of colonization and infection in hospitalized patients may be delayed. In facilities where organisms, such as VRE, have not yet been detected, implementing special measures and a surveillance program may promote earlier detection of these resistant organisms.

Components of an effective surveillance system include:

- Establish and maintain a system that will track resistant organisms. It is important to collect, at a minimum, information about the patient, the location of the patient in the facility, the date and identification of the MDRO, and the body fluid from which the MDRO was isolated.
- Distinguish between nosocomial and community-associated cases.
- Routinely review culture and sensitivity data.

- Develop ongoing systematic data collection and analysis that will illustrate MDRO trends.

The frequency and intensity of surveillance should be based on the type of facility and the population served. There is not a "one-size-fits-all" approach. Each facility needs to evaluate the risk that MDRO pose to its patients and the infection control resources that are available. A facility that has a high risk of transmission and serious infections with MDRO may choose to have a surveillance plan that includes continuous, ongoing surveillance of all MDRO, including both nosocomial and community-associated cases. Another facility with a low risk may have supportive data to perform quarterly assessment of their nosocomial MDRO. For all surveillance plans, it is essential to meet the following criteria:

- The plan must be based on the demographics of your facility.
- There should be a method for timely detection of MDRO.
- There should be an annual evaluation of the plan's effectiveness.
 - The evaluation should include infection rates, not raw numbers.
 - The information gained from the evaluation should be used to improve quality.
- An annual antibiogram review should be considered (facility-specific antibiotic sensitivity patterns).

Environmental culturing is one surveillance strategy that is not routinely recommended but may be recommended in certain situations, such as during an outbreak investigation.

IX. Microbiology Laboratory

Practices:

The microbiology laboratory's practices should be current with the Committee for Clinical Laboratory Standards when testing for any antimicrobial-resistant organism.

Specific practices to be used when VISA/VRSA is suspected are found at the CDC Internet site: <http://www.cdc.gov/ncidod/hip/vanco/vanco.htm>.

X. Recommendations for Admission, Discharge/Transfer of Patients with MDRO

A. Admission

1. All facilities/agencies shall have policies in place that include at a minimum:

- Admission of a person with MDRO shall not be denied solely on the presence of the MDRO.
- Negative cultures shall not be required for admission to a facility/agency or service.
- Positive MDRO culture status shall be communicated to a receiving facility/agency in a timely manner.

2. Acute care facilities shall have policies in place that include at a minimum:

- Ensure timely and appropriate isolation precautions for persons colonized or infected with MDRO. Isolation precautions will be consistent with the intent of the Healthcare Infection Control Practices Advisory Committee (HICPAC) *Guideline for Isolation Precautions in Hospitals*.

- Facilities should have a reliable method for identifying persons with a previous MDRO when they present for readmission.
- Consideration for room placement of patients known to be infected/colonized with MDRO include:
 - a. Preferably a single room with a self-contained bathroom. A single room with a self-contained bathroom should always be used in units caring for susceptible or immunocompromised patients, in intensive care, burn, transplant, or oncology units.
 - b. Cohorting (placement of patients with the same organism in the same room) of patients infected or colonized with the same MDRO is a second choice.
 - c. Room or ward sharing with a non-infected/non-colonized patient is the third choice. Roommates should not be immunocompromised or have open wounds or invasive devices. Colonized or infected patients should not have a draining wound that is not contained or should not be incontinent of stool or urine if the organism is present in those body fluids.

3. Non-Acute Care Facilities (residential settings, such as long-term care [LTC], skilled nursing homes, home care, hemodialysis centers, and physicians offices) shall have policies in place that include at a minimum:

- Since a LTC facility is generally considered a patient's home, patients should be allowed to ambulate, socialize, and participate in activities as long as contaminated body substances are contained. Where appropriate, enhanced barrier protection to contain a body substance is preferred over restriction of the patient.
- Patient placement options include: in a private room, in the same room as another patient with the same organism, or in the same room as a patient who does not have risk factors for infection.
- Dialyze the patient at a station with as few adjacent stations as possible.

B. Discharge/Transfer for all Facilities/Agencies

- Discharge/Transfer a patient with MDRO whenever the physician deems that the patient is medically ready. Discharge should never be delayed solely on the basis of the MDRO.
- Timely communication with the receiving facility/agency should include laboratory results (include the fact that some may be pending).
- The presence of the MDRO is not a contraindication to sending a patient home or transferring to another facility if otherwise adequate care can be provided to the patient.
- Receiving facility/agency should not expect the patient to have a negative culture prior to being accepted for admission.
- Household arrangements should not be disrupted because a household member has MDRO. MDRO rarely cause serious infections in healthy family members.
- Receiving facility/agency should not expect isolation precautions to be discontinued prior to the patient being accepted for admission. Criteria for discontinuing isolation have not been scientifically defined. Development of such criteria is difficult due to intermittent carriage. For example, *enterococcus* spp. are normal bowel flora; VRE may persist indefinitely and be shed intermittently. Thus, screening cultures may not reliably indicate the presence or absence of VRE.
- A history of MDRO should be prominently documented in the patient's record and some mechanism be established to alert staff so the precautions commensurate with the risk of transmission can be established on readmission.

XI. Recommendations for Control of MDRO (minimum standards)

A. All Facilities

Standard precautions should be used by all facilities. Use of control measures when VISA/VRSA is identified is critical. Guidance on precautions to utilize when VISA/VRSA is identified are found at the CDC Internet site: <http://www.cdc.gov/ncidod/hip/vanco/vanco.htm>.

B. Acute Care Facilities

Acute care facilities shall have written policies detailing implementation of appropriate precautions when caring for patients with MDRO. Policies should be consistent with the intent of current practice standards. The following should be considered when developing policies:

- Hand hygiene shall occur before and after any patient contact. Hand hygiene shall occur after glove removal, before eating or drinking, after toileting, and after handling any potentially contaminated items. Use of hand-hygiene agents, including alcohol hand-sanitizing products, should be consistent with current guidelines.
- The standard of care is use of Contact Precautions by all health care workers upon entering the patient's room. Use appropriate signage denoting Contact Precautions. If applicable, chart should be marked as well.
- Gloves shall be worn for any direct patient contact. Gloves must be changed between procedures. Hand hygiene shall occur in between all glove changes. Gloves shall be removed before leaving the room and hand hygiene should occur.
- Gowns shall be worn for substantial contact with the patient, environmental surfaces or items in the patient's room, or if the patient is incontinent, or has diarrhea or wound drainage that is not contained by a dressing, colostomy, or ileostomy.
- Remove barriers before leaving the room/treatment area.
- Daily, routine cleaning must be done in all patient service areas to reduce the microbial load. Cleaning must be done with a hospital-grade disinfectant, and cleaning must be performed in a sanitary manner consistent with facility procedures. Terminal cleaning must be done consistent with facility procedures.
- Dedicate equipment for patients with MDRO. If equipment cannot be dedicated, it must be cleaned with a hospital-grade disinfectant prior to being used for another patient.
- Active surveillance cultures may be considered as a method to identify the reservoir for spread of MRSA and VRE infections according to the Society for Healthcare Epidemiology of America (SHEA).

Variance from the above practice standards may be appropriate when supported by published peer review recommendations and facility-specific epidemiology data. CDC recommends that standard precautions be used for all patient care. In addition, CDC recommends use of Contact Precautions when the facility (based on national or local regulations) deems the MDRO to be of special clinical and epidemiologic significance. In situations where a suspected or confirmed outbreak of MDRO is occurring, Contact Precautions should be seriously considered.

Adherence with current published recommendations for control of VISA/VRSA is indicated. Guidance on the investigation and control of VISA/VRSA is found at the CDC Internet site: <http://www.cdc.gov/ncidod/hip/vanco/vanco.htm>.

C. Non-Acute Care Facilities/Agencies

Regulated facilities shall have written policies detailing implementation of appropriate precautions for persons with MDRO that are consistent with the scope of services provided. Agencies should consider having written policies in place. The following should be considered when developing policies:

- Hand hygiene shall occur before and after any skin-to-skin contact with a patient. Hand hygiene shall occur after glove removal, before eating or drinking, after toileting, and after handling any potentially contaminated items. Use of hand-hygiene agents, including alcohol hand-sanitizing products, should be consistent with current guidelines.
- Remove barriers before leaving the patient's room or treatment area.
- Standard precautions will be used for all patient care. In addition, CDC recommends Contact Precautions when the facility (based on national or local regulations) deems the MDRO to be of special clinical and epidemiologic significance. The components of Contact Precautions may be adapted for use in non-acute care facilities, especially when the patient has draining wounds or difficulty containing body fluids. In situations where a suspected or confirmed outbreak of MDRO is occurring, Contact Precautions should be seriously considered.
- Daily, routine cleaning must be done in all patient areas to reduce the microbial load. Cleaning must be done with a hospital-grade disinfectant, and cleaning must be performed in a sanitary manner consistent with facility procedures. Terminal cleaning must be done consistent with facility procedures.

XII. Transporting/Transferring Patients with MDRO (infection or colonization)

A. Acute Care Facilities

Acute care facilities shall have policies in place regarding transporting patients with MDRO that include at a minimum:

- Prior to transport, the receiving department/facility shall be notified that the patient has MDRO and what precautions are necessary.
- When transporting to another department, appropriate precautions must be maintained in the department where the patient is being treated.
- There must be a method in place for health care workers to easily note the type of precautions to use.

B. Non-Acute Care Facilities

Non-acute care facilities shall have policies in place regarding transporting patients with MDRO that include at a minimum:

- Prior to transport, the receiving department/facility shall be notified that the patient has MDRO and what precautions are needed.

XIII. Discontinuing Isolation Precautions

There is no definitive data to determine when it is appropriate to discontinue isolation. Protocols vary as to methods to discontinue isolation. The CDC recommendations found in *Guidelines for Isolation Precautions in Hospitals* include a negative culture and no longer taking antibiotics for MDRO.

XIV. Indications for Decolonization

A. Decolonization for Patients with MRSA

Indications for decolonization for patients with MRSA are:

- Except in epidemic situations, routine decolonization is not recommended for the management of MRSA, as there is varying support within the literature.
- Decolonization should be undertaken only after careful consideration of the situation and generally with the assistance of a physician trained in infectious disease or epidemiology. The local health department may also assist in these decisions.
- Decolonization may be considered on a case-by-case basis under the following circumstances:
 - If the patient has a medical condition, particularly one involving immunosuppression (e.g., diabetes mellitus, renal failure, or is on high-dose steroids or chemotherapy) which would place him/her at unusual risk for morbidity or mortality should the colonization progress to infection. This does not imply decolonization is an automatic standard.
 - If the patient is likely to spread the organism to other persons. An example would be the mentally challenged or confused individual who cannot keep a decubitus ulcer covered and who has frequent contact with other patients.
 - If the patient is going to a MRSA-free facility that has many high-risk patients.
 - Health care personnel should be cultured only if epidemiologic data implicate them (e.g., by geographic location or patient care team) as a possible source of dissemination of MRSA. Identified infected personnel with hand or skin lesions should be treated. Decolonization should be considered for those employees with persistent MRSA nasal carriage and are implicated in MRSA dissemination (e.g., chronic sinusitis), especially if the health care worker had contact with patients who were subsequently found to be positive for the same bacterial strains.
- If decolonization is considered, the ability of the patient to tolerate the recommended medications and the benefits must be weighed against the risks. Decolonization and treatment is of limited value without staff education. Adherence to infection control standards is vital. Topical or systemic antibiotics, including trimethoprim-sulfamethoxazole, rifampin, ciprofloxacin, erythromycin, doxycycline, bacitracin, and mupirocin have been used with variable results to eradicate colonization of MRSA. Vancomycin is not indicated for decolonization therapy, as it is ineffective for this purpose.

B. Decolonization for Patients with VRE

Routine decolonization is not a recommendation for the management of VRE, and there is no clinically proven regimen.

C. Indications for Decolonization for Patients with VISA/VRSA

The decision to decolonize should be made by the patient's primary physician in consultation with the infection control team and the local/state health department.

XV. Recommendations for Treatment of Infection

Treatment using currently accepted therapy is recommended. Helpful information regarding therapy follows:

- Infection with MRSA should be treated using currently accepted therapy. Traditionally, this has been vancomycin. Recently, linezolid has been approved by the U.S. Food and Drug Administration (FDA) for use in treating MRSA. In vitro studies indicate that synecid might have activity against MRSA as well.
- Infection with VRE should be treated using currently accepted therapy. Regimens using synecid, linezolid, chloroamphenicol, and high dose ampicillin/gentamycin may be acceptable. Treatment should be undertaken in consultation with a physician trained in infectious disease or epidemiology.
- VISA/VRSA isolates may be susceptible in vitro to several antimicrobial agents, including antimicrobials recently approved by the FDA (e.g., linezolid and quinupristin/dalfopristin) with activity against glycopeptide-resistant gram-positive microorganisms.

NOTE: The use of trade names is for identification purposes only and does not imply endorsement by the Association for Professionals in Infection Control and Epidemiology (APIC) or the Indiana State Department of Health (ISDH).

XVI. Recommendations for Management of MDRO Outbreak

The following recommendations will be helpful in managing outbreaks of MDRO:

- Maintaining a good surveillance system will alert the facility/agency to an increased number of cases at a time when developing a plan of control is a manageable task.
- When an increased incidence of nosocomially acquired cases appears, the facility/agency should look for an epidemiologic association. An epidemiologic association refers to a relationship in person, place, or time. For example, if a nosocomially acquired case of MDRO occurs within a week following a case in an adjoining room or where there are commonalties such as equipment sharing, the cases could be related.
- When an outbreak is recognized and the susceptibility profiles of the organism are similar or the same (in different patients), DNA molecular typing would be valuable to determine if the same strain is being passed from patient to patient. If the same strain is identified, a search for a common source should be initiated. An evaluation of housekeeping practices, hand hygiene, disinfection, compliance to aseptic techniques and to isolation procedures may be indicated. Common equipment (used by each of the infected/colonized patients) or common treatment modalities may also need to be investigated.
- In an outbreak, Contact Precautions should be used in acute care settings for all colonized or infected patients with MDRO. In other settings, Contact Precautions should be strongly considered. If the infection control practices have been evaluated and corrected and ongoing transmission of the organisms continues, cohorting of patients may be considered. Patients in a cohort should be separated from other patients to the extent

- permitted by architectural and environmental limitations of the facility/agency. To the maximum extent possible, staff assigned to the cohort should work with the cohort patients only. Health care workers who must provide care to both affected and non-affected patients in the same shift should make every effort to limit movement between the two groups. Care should be provided to the non-cohort patients first if possible. Appropriate hand hygiene should occur before and after movement between cohorts.
- Physicians and hospitals must report outbreaks of MDRO to the ISDH (410 IAC-1-2.3).

XVII. Recommendations for Education of Health Care Workers

Education programs for health care workers (HCW) should be facilitated by an individual with responsibility in infection control and should occur on a regularly scheduled basis. Education and communication are key elements in reducing the transmission possibilities of drug-resistant organisms.

Education for health care workers should include at a minimum:

- Promotion of hand hygiene for the HCW, patient, and family members and visitors.
- Use of appropriate hand-hygiene products including antimicrobial products.
- The epidemiology of specific drug-resistant organisms, review of basic microbiology, and modes for transmission of specific microorganisms.
- Difference between colonization and infection with MDRO.
- Principles and facility-specific precautions.
- Glove and gown-wearing basics, including hand hygiene after glove removal.
- Cleaning/Disinfecting of shared equipment and environmental surfaces.
- Use of environmental cleaning products.
- Appropriate use of antibiotics.

Education for patients/residents/clients and their family members should include:

- Basic information about the specific MDRO.
- Hand hygiene.
- Explanation of the facility-specific policy.
- Differences in the infection control practices they may experience when traveling between acute care, long-term care, and home care environments due to differing populations at risk, as well as varying differences in the physical environments.
- Appropriate use of antibiotics.

XVIII. Recommendations for Visitors

Facilities should inform visitors of the need to wash their hands before leaving the room of a patient with MDRO. Gloves should be worn if contact with moist body substances is expected, and gowns should be considered if excessive contact with body fluids is expected.

In general, healthy people, including infants and children, are at low risk of becoming infected with MDRO. Therefore, casual contact, such as kissing, hugging, and touching, is acceptable.

XIX. Recommendations for Caregivers in the Home

Although healthy people are at low risk of disease from MDRO, caregivers may want to consider the following precautions:

- Washing hands with soap and water after physical contact with a person either infected or colonized with MDRO and before leaving the home. Hand-hygiene products may also be used.
- Towels used for drying hands after contact should be single use.
- Disposable gloves should be worn if contact with body fluids is expected and hands washed after removing the gloves.
- Linens should be changed and washed if soiled and on a routine basis.
- The environment should be cleaned routinely and when soiled by body fluids.
- Inform doctors and other health care personnel that the patient is infected or colonized with MDRO.

XX. References

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